



Building 911C  
P.O. Box 5000  
Upton, NY 11973-5000  
Phone 631 344-4531  
Fax 631 344-5954  
hershcovitch@bnl.gov

## Memo

*DATE:* September 24, 2004

*TO:* RHIC E-Coolers

*FROM:* Ady Herscovitch

*SUBJECT:* **Minutes of the September 24, 2004 Meeting**

Present: Rama Calaga, Xiangyun Chang, Alexei Fedotov, Wolfram Fischer, Ady Herscovitch, Jorg Kewisch, Vladimir Litvinenko, Derek Lowenstein, William Mackay, Thomas Roser, Alexander Smirnov (JINR Dubna, Russia), Triveni Srinivasan-Rao, Dejan Trbojevic, Jie Wei.

Topics discussed: 939 Setup, Computations and Simulations

**939 Setup:** Triveni opened the meeting with a report on experiments with the superconducting RF gun (SCRF). It was cooled to 4 K (cooling power of 20 W). A niobium cathode was used. With psec pulsed 248-nm excimer laser, 0.5 nC were obtained on the Faraday per pulse. Xiangyun Chang performed a transport loss simulation and found it to be 90%. From that information, it means that 5 nC are extracted per pulse, and hence, the extracted current is space charge dominated. Good news indeed! On the negative side the quantum efficiency was only  $2 \times 10^{-5}$ , an order of magnitude lower than expected. To verify that claim, the experiment was repeated with psec pulsed YAG laser (with much lower energy per photon energy; at the borderline of the 4.6 eV ionization potential of niobium) was used. 15 – 20 nA were extracted. The quantum efficiency was about  $10^{-6}$ , again an order of magnitude below what was expected.

In answer to Thomas' questions on what was the expected quantum efficiency based on, and why is it lower than expected, Triveni replied that expected quantum efficiency was based on room temperature measurements. The lower quantum efficiency is most likely due to oxidation during cathode exposure to air. Plans are to laser clean the cathode while under vacuum and to cool the cavity to 2 K

**Computations and Simulations:** Xiangyun Chang showed beam dynamics simulations, in which an extra solenoid was added between the gun and the LINAC. He used 20 nC bunches in the simulations. The resultant effect was to reduce the emittance by a factor of 2 before entering the LINAC! Similar results were obtained with both ellipsoidal and Gaussian laser beams on cathode. A discussion ensued regarding the mechanism for the emittance decrease. It seems to be due to "untwisting" twisted part of the emittance due to space charge. Very encouraging! And, the system is not yet optimized.

Alexei showed more intra-beam scattering (IBS) simulations with comparison to RHIC data that was obtained during the March 16, 2004 run with 100 GeV/u gold beam without collisions. Just as earlier simulations (presented during the August 27, 2004 meeting), these latest simulations too showed good qualitative agreement with experiment. But, the latest results also show much better quantitative agreement.

Alexei also pointed out that in attendance is Alexander Smirnov from JINR Dubna, Russia, who has been working on further improvements to the BETACOOOL simulation code.